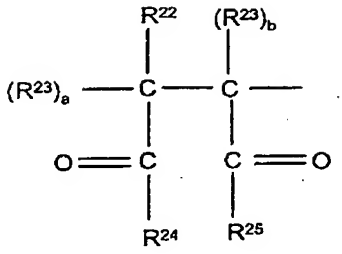
REMARKS

The Office Action mailed 28 November 2007 has been carefully considered together with each of the references cited therein. The amendments and remarks presented herein are believed to be fully responsive to the Office Action. Accordingly, reconsideration of the present Application in view of the following remarks is respectfully requested.

Applicant's invention relates to the discovery of a composition which transforms concentrated fatty acid additive mixtures into flowable, storage-stable liquid solutions at low temperatures. Concentrated fatty acid additive mixtures are typically solid or form crystals at low temperatures, i. e. often at room temperature, but usually at temperatures below 0°C to at the least -5°C (See Applicant's Specification paragraph [009] and comparative examples in Table 1). Typically, to add additives to fuels the additives have to be liquid. Adding additives based on fatty acids mixtures to middle distillate fuels, prior to Applicant's invention, required the additive be heated or highly diluted to make pumping and dosing of the additive possible. The advantage provided by Applicant's flowable, homogeneous liquid concentrates is the ability of Applicant's concentrates to be applied at low temperatures. Therefore the additive can also be used in remote places like depots without the requirement of heated tanks and heated pipelines. Furthermore the additives of the subject application can be stored as a concentrate which reduces the amount of volume to be transported to the user and to be stored at the user. Thus, the instant invention provides significant energy saving during transportation and storage. More specifically, the instant application is directed to a low-temperature, storage stable liquid additive concentrate comprising an organic solvent and fatty acids, and a particular polar nitrogen compound to disperse and stabilize the fatty acids in the organic solvent, wherein the polar nitrogen compound comprises 20 to 80 mol-% of a divalent structural unit as recited in claim 1 according to formula 12:



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The additive concentrate is useful for improving the lubricity of low-sulfur middle distillate fuel oils. More particularly, Applicant's invention relates to a storage stable and homogeneous liquid additive mixture which can be used at low temperatures to improve the lubricity of a low sulfur middle distillate; i.e., at or below a temperature of 0°C, without the need to store or dispense the additive in greatly diluted form and without the need to store and handle the additive concentrate in heated storage tanks and heated pipelines.

Response to Examiner's Arguments:

1. The JP reference (JP 11001692) discloses only that the fatty acid mixture may be combined with a cold flow improver in a fuel oil as a minor fraction of that fuel oil.
2. The Krull '632 Patent (US 5,391,632) discloses that the polar nitrogen containing compound may be combined with other cold flow improvers. Krull (Col 11, lines 10-16) that the combination of such additives and middle distillates is achieved by heating the fuel and the additives to a mixing temperature of 50°C to obtain the best distribution of the additive in the middle distillate fuel oil. Cold flow improvers are compounds which inhibit paraffin formation in fuel oils. Fatty acids are not considered by any one skilled in the art to be cold flow improvers, rather they are well know as lubricity improvers and are also well known to be solid or form crystals at room temperature or colder and there use in resoling cold flow issues

would be antithetical to one skilled in the art concerned with avoiding solid formation.

3. Applicant respectfully would like to point out that in the translation of the JP Reference supplied by the Examiner, paragraph 25 does not state that it is preferable to dissolve fatty acid mixtures **and** low temperature flow improvers **together** in a single solvent. Rather, the JP Reference uses the word "respectively" and uses the term "solvent" in the plural and states that fuel oils containing the fatty acids and other low-temperature flow improving agents may be compounded by dissolving

> *"....the fatty acid mixtures and the low-temperature flow improving agents, **respectively in suitable solvents**, followed by adding **them** to the middle distillates."*

One skilled in the art confronted with the above statement would not interpret that both the fatty acid and the cold flow improver were combined in a single solvent, rather it is clear that the fatty acids would be concentrated in a first solvent and the cold flow improvers would be concentrated in a second solvent, and that these different concentrates would be combined with the fuel oil by injecting them **separately** into the fuel oil according to the desired properties of the finished fuel oil. Furthermore, combining both types of additives in the same concentrate would be seen to limit the flexibility of the individual additive concentrates to meet the normal variation in blending properties in commercial practice.

4. Applicant maintains that the JP Reference only discloses blends of middle distillate fuels with fatty acids and cold flow improvers, not concentrates of fatty acids with cold flow improvers together in a single concentrated additive.

5. Regarding the motivation for the combination of fatty acids with paraffin inhibiting terpolymers, Applicant does not dispute the combination of fatty acids and cold flow improvers as minor portions of fuel oils to obtain improved properties of the fuel oils. But, there is no disclosure in either the JP Reference or the Krull '632 Patent which says that combining fatty

acids with cold flow improvers improves the properties of fatty acid mixtures. Krull (Column 9, line 44 and column 10, line 30) discloses that cold flow properties of **middle distillates** are improved. Krull does not provide any broader teaching which might extend to concentrates of fatty acids.

6. Applicant apologizes for the error in referring to an attached declaration. Applicant intended to refer to the Declaration which was filed with Applicant's response of April 2, 2007.

Claim Rejections

Claim 7 was rejected under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 in view of Krull (US 5,391,632). The rejection of claim 7 under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 should be withdrawn for the reason that JP 11001692 does not disclose an additive containing a mixture of fatty acids and the polar nitrogen-containing terpolymer compound claimed by the applicant, and no one skilled in the art would be motivated to employ Applicant's specific terpolymer based on the combination of the JP 11001692 disclosure of fatty acids and the general teachings of the US 5,391,632 reference for improvement of cold flow properties of fuel oils to arrive at Applicant's low-temperature-stabilized liquid solution.

The JP reference teaches a low sulfur middle distillate fuel oil comprising less than 0.2 wt % sulfur. The fuel oil contains from 0.001-0.5 wt % of a C_8-C_{30} fatty acid mixture which contains unsaturated fatty acids having a single double bond and a fatty acid containing two double bonds and other additives such as flow improvers. The acids are used in a ratio of 1:3 to 15:1 (see claim 1). At paragraphs 16 and 17, the JP Reference teaches fatty acid mixtures containing saturated fatty acids . The JP Reference teaches the further separate addition of nitrogen containing compounds (amides/salts) that function as cold temperature fluidity improvers (paraffin dispersants) at a ratio of 1:10-5:1 (see paragraphs 0019-0020). The fluidity improvers also include copolymers such as ethylene vinyl esters. The JP Reference also teaches that concentrates of fatty acids may be prepared by dissolving the fatty acids in organic solvents which are miscible with middle distillates. However, the JP

reference specifically discloses that fuel oils containing the fatty acids and other low-temperature flow improving agents may be compounded by dissolving the "...fatty acid mixtures and the low-temperature flow improving agents, **respectively in suitable solvents**, followed by adding **them** to the middle distillates."
Thus, the JP Reference clearly says that the fatty acid concentrate is dissolved in a suitable solvent, and separately other low-temperature flow improving agents are dissolved in suitable solvents and that these separately prepared concentrates can be added to the middle distillate to provide the additized fuel oil (fuel oil containing the additive). There is nothing in the JP Reference which discloses the preparation of a concentrate which contains any combination of the fatty acids with other low-temperature flow improving agents (See paragraphs 24 and 25).

The JP Reference differs from Applicant's invention as claimed in claim 1 in that the JP Reference does not specifically teach Applicant's claimed polar nitrogen-containing compound which Applicant employs to disperse fatty acids in Applicant's liquid solution as claimed in claim 1. The Japanese Reference discloses the separate formation of additive concentrates in separate suitable solvents for different middle distillate fuel additives. The JP Reference is silent on any combination of a fatty acid with another cold flow additive, except when present in a middle distillate fuel oil.

Krull discloses that polar nitrogen compounds which are terpolymers based on α,β-unsaturated dicarboxylic anhydrides, α,β-unsaturated compounds and polyoxyalkylene ethers of lower unsaturated alcohols can be used as paraffin inhibitors in crude oils and petroleum products. Krull further discloses mixtures of at least one of the disclosed terpolymers and at least one ethylene-vinyl ester copolymer for use as paraffin inhibitors. Krull discloses at column 2, lines 21-32 that Krull's terpolymer can be combined with "known paraffin inhibitors, preferably copolymers based on ethylene and vinyl acetate." **Fatty acids are not known paraffin inhibiting additives for use in middle distillates.** There is no disclosure within the Krull '632 Patent that would teach or suggest to anyone skilled in the art that any amount of the polar nitrogen compound would be effective to disperse fatty acids in a concentrated solution of fatty acids in an organic solvent. **Krull in the '632**

Patent only discloses a polar nitrogen compound for improving the cold flow properties of a low-sulfur fuel oil by dispersing paraffins. Krull further discloses that the polar nitrogen compound can be combined with other **known paraffin inhibiting** additives as part of a fuel oil mixture, not an additive concentrate comprising fatty acids, and Krull does not disclose that the polar nitrogen compound may be used for dispersing fatty acids. In Table 1 of the Declaration filed with Applicant's response of April 2, 2007, Dr. Krull showed in a side-by-side comparison that a mixture of a fatty acids with the addition of the polar-nitrogen cold flow improver compound characterized as recited in Applicant's claim 7, **surprisingly reduced the pour point of the fatty acid**/polar nitrogen compound/organic solvent mixture, while other well-known cold flow improvers such as **those disclosed in the JP reference (JP11-001692) all increased the pour point of the resulting mixture of the fatty acid and the other cold flow improvers (B9, B10 &B11)**. In Table 2, only the cloud points (the temperature at which crystals form in the mixture) of the fatty acid/polar-nitrogen mixture according to the Applicant' invention improved, while the cloud points of the mixtures of fatty acid and other cold flow improvers according to the JP reference (B9, B10 &B11) remained essentially unchanged. In Table 3 of the Declaration, the only mixtures of fatty acid and cold flow improver which remained liquid were the fatty acid/polar-nitrogen compound blends of the instant invention. This response was clearly unexpected.

There is no disclosure in the JP reference of a storage stable, flowable liquid additive mixture which is present with any other low-temperature flow improving agent. The JP reference only combines fatty acids with other cold flow improvers when providing a treated middle distillate fuel oil. The JP reference discloses that fatty acid concentrates as well as cold flow improver concentrates separately can be incorporated into a fuel oil as a concentrate, but the JP reference is silent on the use of any of Applicant's specific terpolymers which are nitrogen-containing compounds for the improvement of the cold flow properties or the dispersion of fatty acids. The JP reference does not teach any iodine number of the mixture of the fatty acids. The JP reference does not teach or suggest that any nitrogen-containing polymers must be present in the additive in an amount of from 0.01 to 90% by weight, based on the

total weight of the fatty acids and the nitrogen containing compound A1), A2) and B). The Examiner alleges that it would be obvious to anyone skilled in the art based on the disclosure of Krull ('632 at column 2, lines 21-32, shown hereinbelow) to combine the nitrogen-containing compounds of the '632 Patent which discloses the terpolymer paraffin dispersant with "other cold temperature fluidity improvers" for use in middle distillate fuel oils to disperse paraffins in the middle distillate oils.

> It has likewise been found that addition of alcohol/amine-modified terpolymers based on α,β-unsaturated dicarboxylic anhydrides, α,β-unsaturated compounds and polyoxyalkylene ethers of lower unsaturated alcohols, if desired in admixture with known paraffin inhibitors, preferably copolymers based on ethylene and vinyl acetate, results in the paraffin crystals which precipitate on cooling remaining dispersed. As a result of this uniform dispersion, a homogeneously turbid phase is obtained in which the CFPP (cold filter plugging point) value, which is critical for operability, of the upper and lower phases is approximately the same.

The '632 Patent discloses the combination of the terpolymer polar nitrogen containing paraffin inhibitor with other "known paraffin inhibitors" and specifically mentions copolymers based on ethylene and vinyl acetate and not include fatty acids.

The mixtures of fatty acids which are disclosed in the JP reference (See paragraphs [0018] and [0019]) to be lubricity improvers, are not paraffin inhibitors. Nowhere in the '632 Patent or in the JP reference are fatty acids disclosed as paraffin inhibitors. Fatty acids do not function as paraffin inhibitors; in fact, fatty acids tend themselves to form solid crystals at low temperatures potentially complicating paraffin inhibiting action and giving rise to handling problems. (See Applicant's Specification at paragraph [009]). Thus, no one skilled in the art based solely on the disclosure in the '632 Patent would be motivated to combine fatty acids which are solid at low temperatures or known to form crystals which might reduce or interfere with paraffin inhibiting action in a paraffin inhibiting concentrate for low temperature blending in middle distillates with the paraffin inhibiting terpolymers disclosed in the '632 Patent for the purpose of creating a low-temperature storage stable, flowable liquid additive mixture. The prior art references must be read as a whole and consideration must be given where the reference diverges and teaches away from

the claimed invention. No one skilled in the art would be able to combine any of the teachings of the JP Reference and '632 Patent to render the instant invention obvious without the improper use of hindsight.

Furthermore, Applicant has demonstrated in Applicant's Specification in Table 1 the unexpected improvement in the cold flow properties of the liquid fatty acid additive for the claimed combination. In Tables 3 and 4, Applicant demonstrated the unexpected improvement in storage stability for the claimed fatty acid mixtures compared to the storage stability of the individual components. For example in Table 1, comparative Example C2, a mixture of oleic and linoleic fatty acids (A2), and comparative Example C3, a polar nitrogen compound being a product of a terpolymer of C_{14}/C_{16}-alpha-olefin, maleic anhydride and allylpolyglycol with 2 equivalents of ditallow fatty amine in a 50% by weight naphtha solution (B1), with Examples 13-15, according to the subject application. Note that the pour points of C2 and C3 were 6 and 9, respectively, with the pour points of Examples 13-15, representing compositions of 80/20 to 20/80 wt-% of the fatty acid mixture to the polar nitrogen compound having pour points of -27 to -54 °C. In Table 3, Examples 39 and 40 showed that additive concentrate mixtures of 20/80 and 80/20 remained liquid after 3 days at -20 °C, while individual components A2 and B1 shown as Examples C9 and C10 showed that at -20°C, the individual A2 and B1 components were both solid. In Table 4, Examples 43-48, compared to Example C13 showed that without any of component B1 in fatty acid mixture A1, having an Iodine Number of 155 g of I/100g, that A1 always produced a sediment, while Examples 43-48 representing increasing proportions of B1 ranging from 100 to 50,000 ppm in the additive concentrate showed no sediment over 7 days at -20°C, and no sediment after 1 day at -28°C.

Still further, and with reference to the Declaration submitted on April 2, 2007 by Dr. Matthias Krull, one of the named inventors of the subject application, under 37 C.F.R. 1.132, additional data were presented which showed a side-by-side comparison of the present invention with combinations of fatty acids and cold flow improvers such as disclosed in the JP Reference and compositions of fatty acids

and the polar nitrogen-containing compounds disclosed as B1 in Applicant's Specification. A variety of cold flow improvers selected from the list of materials which were disclosed in the Japanese reference (JP 11-001692) were tested in comparison to the polar nitrogen-containing compound B1) of the subject application to assess the cold flow improvement of fatty acid mixtures and their solutions in organic solvents. The materials used were the following:

Fatty Acids:

A3) Tall oil fatty acid comprising 29 % oleic acid, 64 % linoleic and other polyunsaturated acids and 3 % of saturated acids. Iodine number 158 gI/100g. (similar to A1 of the subject application)

A4) Oleic acid (technical grade) comprising 67 % oleic acid, 11 % linoleic acid, 5 % of hexadecenoic acid and 12 % of saturated fatty acids. Iodine number 85 gI/100g. (similar to A2 of the subject application)

Polar Nitrogen-Containing Compound:

B1) Product of the reaction of a terpolymer of $C_{14}/_{16}$-α-Olefin, maleic anhydride and allylpolyglycol with 2 equivalents of ditallow fatty amine, 50 % active in aromatic naphtha. This is the same polar nitrogen-containing compound as disclosed as B1 in the subject application.

Other Typical Cold Flow Improvers:

B9) EVA copolymer (27 wt.-% vinyl acetate, molecular weight of 13.000), 50 % active in aromatic naphtha (comparison).

B10) Poly(tallow fatty ester of acrylic acid) (molecular weight of 75.000), 50 % active in aromatic naphtha (comparison).

B11) Behenic acid diester of poly(ethylene glycol) with molecular weight 600, 50 % active in aromatic naphtha (comparison).

In order to compare the differences between the low-temperature properties of compositions according to the subject application with fatty acid compositions containing fatty acids and other cold flow improvers (for example: B9, B10 and B11),

the pour points (see Table 1), cloud points (see Table 2) and storage stabilities (see Table 3) of these compositions were assessed. Pour points were measured in accordance with ISO 3016 and cloud points were measured in accordance with ISO 3015. The additives mixtures were then stored for 24 hours at -20 °C, and subsequently assessed visually (Table 3). (C) denotes comparative examples.

Table 1: Pour points of the additives

Example	Composition (parts by weight)					Pour Point [°C]
	A1	B1	B9	B10	B11	
1	80	20				-9
2	50	50				-27
3	20	80				-3
4 (C)	80		20			0
5 (C)	50		50			3
6 (C)	20		80			+12
7 (C)	80			20		-3
8 (C)	50			50		6
9 (C)	20			80		+15
10 (C)	80				20	0
11(C)	50				50	+12
12 (C)	20				80	+18
13 (C)	100					-6
14 (C)		100				+9
15 (C)			100			+18
16 (C)				100		+15
17 (C)					100	+21

Table 2: Cloud Points of the fatty acid solutions (For these examples the fatty acid was used as a formulation containing 50 % by weight of fatty acid in aromatic naphtha)

Example	Composition (parts by weight)					Cloud Point [°C]
	A1	B1	B9	B10	B199	
18 (C)	100					-28.5
19	99,95	0,05				-34.0
20	99,8	0,2				-35.0
21	99,5	0,5				-33.5
22 (C)	99,8		0,2			-27.5
23 (C)	99,8			0,2		-29.0
24 (C)	99,8				0,2	-27.0

Table 3: Storage stability of the additives (storage for 24 hours at -20°C)

Example	Composition (parts by weight)					Assessment
	A2	B1	B9	B10	B11	
23 (C)	100					solid
24 (C)		100				solid
25 (C)			100			solid
26 (C)				100		solid
27 (C)					100	solid
28	80	20				liquid
29	50	50				liquid
30(C)	80		20			viscous gel
31 (C)	50		50			solid
32 (C)	80			20		viscous gel
33 (C)	50			50		solid
34 (C)	80				20	solid
35 (C)	50				50	solid

The resulting lower pour points of the fatty acid combinations with component B1, according to the subject application, over a broad range of concentrations clearly show that the concentrated additives disclosed in the subject application can be handled and used at much lower temperatures than neat fatty acids or fatty acids which were combined with other typical cold flow improvers. Similarly, after dilution of the fatty acids with solvent, the onset of crystallization as determined by the cloud point (See Table 2 hereinabove) can be shifted to lower temperatures by introducing the additive components of the subject application. Thus, additive concentrates comprising fatty acids, solvent and minor amounts of Applicant's polar nitrogen-containing compounds, according to the subject application, can be stored and handled at lower temperatures than neat fatty acid solutions or fatty acid solutions containing other flow improvers without the risk of sediment formation or filter blocking. Furthermore, the above results show that compared to combinations of the fatty acids and any other well-known cold flow improvers of the Japanese Reference, the fatty acids when combined with Applicant's polar nitrogen-containing compounds, according to the subject application, do not gel or solidify during prolonged storage at low temperatures. Furthermore, the additive concentrates of the subject invention can be handled and used without prior heating or dilution, even after storage at low temperatures. These measurements show the superior properties of the claimed additive concentrates for stabilizing fatty acids at low temperature in comparison to other known middle distillate cold flow improvers cited in the Japanese Reference (JP 11-001692). No one skilled in the art could have predicted this surprising and unexpected performance in storage stability of the concentrated additive of the instant invention based on any combination of the JP reference or the '632 Patent. Therefore, the rejection of claim 7 under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 in view of US Patent 5,391,632 should be withdrawn for the reason that the JP 11001692 reference by requiring a middle distillate component teaches away from applicant's invention by disclosing the preparation of separate additive concentrates or is at best silent on any combination of the specific terpolymer/polar nitrogen-containing compound with a mixture of fatty acids in the form of a storage stable concentrate, and no one skilled

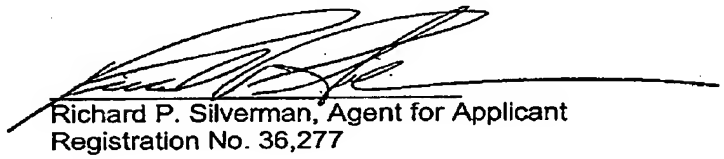
in the art armed with the JP 11001692 reference or the '632 Patent, taken separately or together, would be motivated to arrive at applicant's invention by combining a mixture of fatty acids for lubricity improvement with a paraffin inhibitor as disclosed in the '632 Patent, based solely on the above disclosure in the '632 Patent which refers only to further paraffin dispersants, not dispersants for fatty acids in organic solvents. Furthermore, Applicant has shown unexpected results which demonstrate the storage stability and superior cold flow properties of the claimed combination which is superior to that of the individual components and to other flow improvers.

The rejection of Claims 11-12 under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 in view of US Patent 5,391,632 is now moot in view of Applicant's previous cancellation of claim 11 – 12.

The rejection of Claims 13-18 under 35 U.S.C. §103(a) as being unpatentable over JP 11001692 in view of US Patent 5,391,632 should be withdrawn for the reasons given in support of claim 7, from which they depend.

An early and favorable action on the merits is respectfully requested.

Respectfully submitted,



Richard P. Silverman, Agent for Applicant
Registration No. 36,277

(CUSTOMER NUMBER 25,255)
CLARIANT CORPORATION
INDUSTRIAL PROPERTY DEPARTMENT
4000 Monroe Road
Charlotte, NC 28205
Phone (704) 331-7156
Fax (704) 331-7707